Estimation of Genotoxic Exposures in Children with Neural Tube Defects in Shanxi, China

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INTRODUCTION

The etiology of virtually all diseases consists of a complex interaction between three major determinants: genes, nutrition, and the environment. One method for preventing disease would be to reduce exposures to toxic environmental chemicals.

This poster presents data collected as part of a long-term study to investigate the utility of a matrix of biomarkers in a population with an elevated frequency of NTDs. The study is focusing on the association between maternal exposures to PAHs and inorganic arsenic (Asi), and the risk for congenital malformations of the neural tube in offspring. Preliminary results from *in vitro* and *in vivo* studies using environmental samples are also presented to help understand the effect of environmental chemicals on the human study population.

METHODS

Study Population. Chemical exposures are being assessed in a human population located in Shanxi province, China. Shanxi is a major producer of coal in China. *Data reported from the first six months in 2005 indicate a range of NTDs frequency from 7.9 to 24 per 1,000 live-births in rural areas of Shanxi*. In comparison, NTDs prevalence in the United States, was 0.4 per 1,000 live-births (Mathews et al. 2002). All research activities were conducted in accordance with the guidelines of the Texas A&M University Institutional Review Board.

Salmonella/microsome Assay. The Salmonella/microsome assay was conducted according to Maron and Ames (1983).

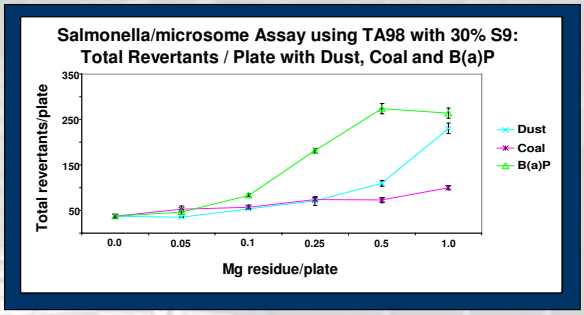
^{32}P-Postlabeling. DNA adduct levels were analyzed using the nuclease P1-enhanced ^{32}P-postlabeling assay described by Reddy and Randerath (1986).

RESULTS
ENVIRONMENT

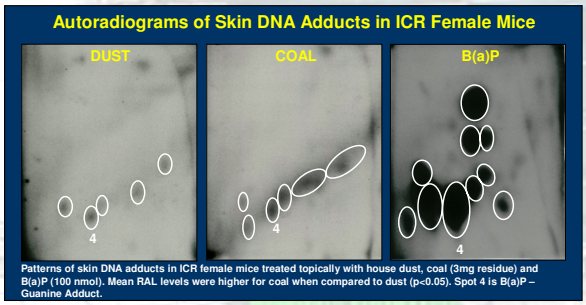
PAHs Levels in House Dust (ng/m^2 wipe area)

	Total PAHs	Carcinogenic PAHs
Min. value	19,700	4,850
Median	101,300	26,000
Max. value	314,900	55,600
Std. deviation	97,000	16,470
Sample size	n=9	n=9

IN VITRO

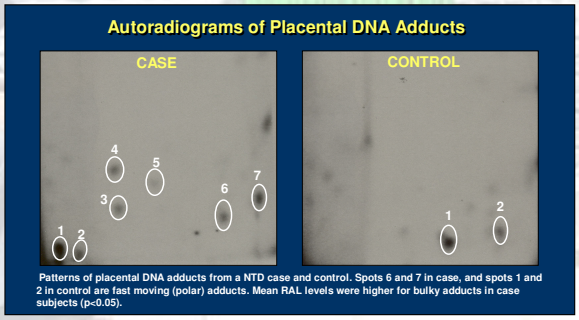


IN VIVO



Patterns of skin DNA adducts in ICR female mice treated topically with house dust, coal (3mg residue) and B(a)P (100 nmol). Mean RAL levels were higher for coal when compared to dust ($p<0.05$). Spot 4 is B(a)P – Guanine Adduct.

POPULATION



Patterns of placental DNA adducts from a NTD case and control. Spots 6 and 7 in case, and spots 1 and 2 in control are fast moving (polar) adducts. Mean RAL levels were higher for bulky adducts in case subjects ($p<0.05$).

CONCLUSIONS

The current study provides evidence that PAH exposures in the population in Shanxi are likely to be elevated. Measurements of PAHs in house dust, as well as DNA adducts in biological tissues clearly indicate that the population is exposed to genotoxic compounds. *In vitro* and *in vivo* bioassays confirm the presence of such compounds in environmental media.

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